

A photograph of a person riding a brown horse across a dry, hilly landscape. The person is wearing a dark jacket and a hat. The background shows rolling hills and mountains under a clear sky. The text is overlaid on the upper half of the image.

Using Earth Observations and Ecosystem Modeling to Improve the Sustainability of Agribusiness and Extractive Industries in Working Landscapes (South Gobi, Mongolia)

Becky Chaplin-Kramer
Natural Capital Project, Stanford University

@beckyck
@natcapproject

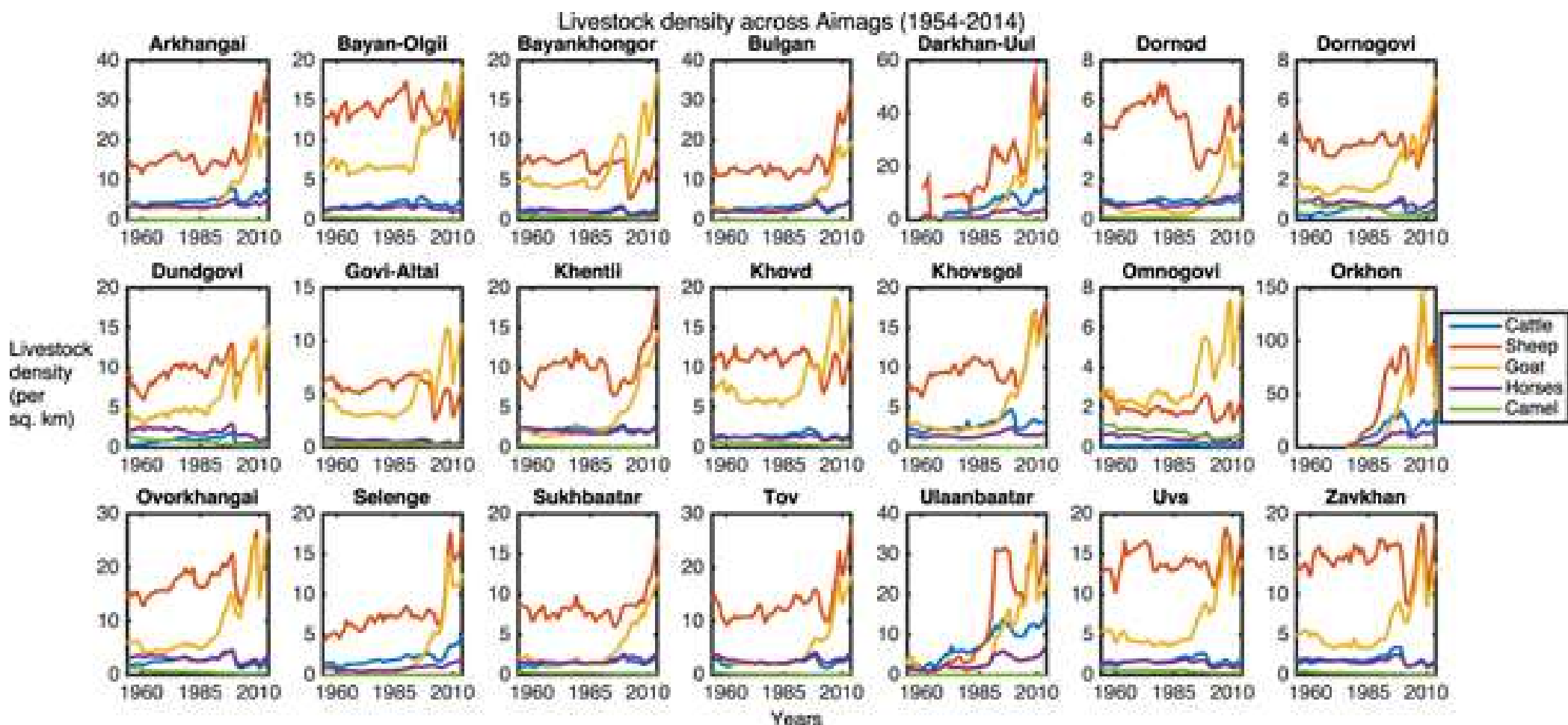
**natural
capital**
PROJECT



© Dan & Sandy Ciske,
Wild Mongolia

© ganbayar/hureelen

© WCS Mongolia

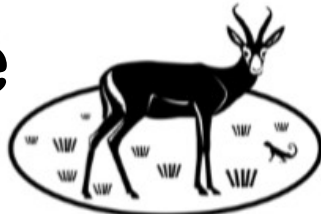


Palat Rao et al. 2015 ERL

Regenerative agriculture for biodiversity & ecosystem services: assessing impacts of sustainable cashmere for mining offsets and supply chain decisions



Sustainable Cashmere Project



Wildlife



Pasture



Livelihoods



No poaching



Awareness



Rangeland monitoring



Breeding



Sorting, cleaning



Health



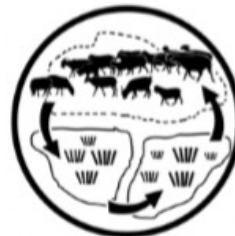
Certification



Wildlife
monitoring



Guardian dog



Pasture management



Capacity building



Alternative income

KERING



Questions for the Sustainable Cashmere Project



Are changes in grazing management able to offset mining impacts enough to have a net positive impact?



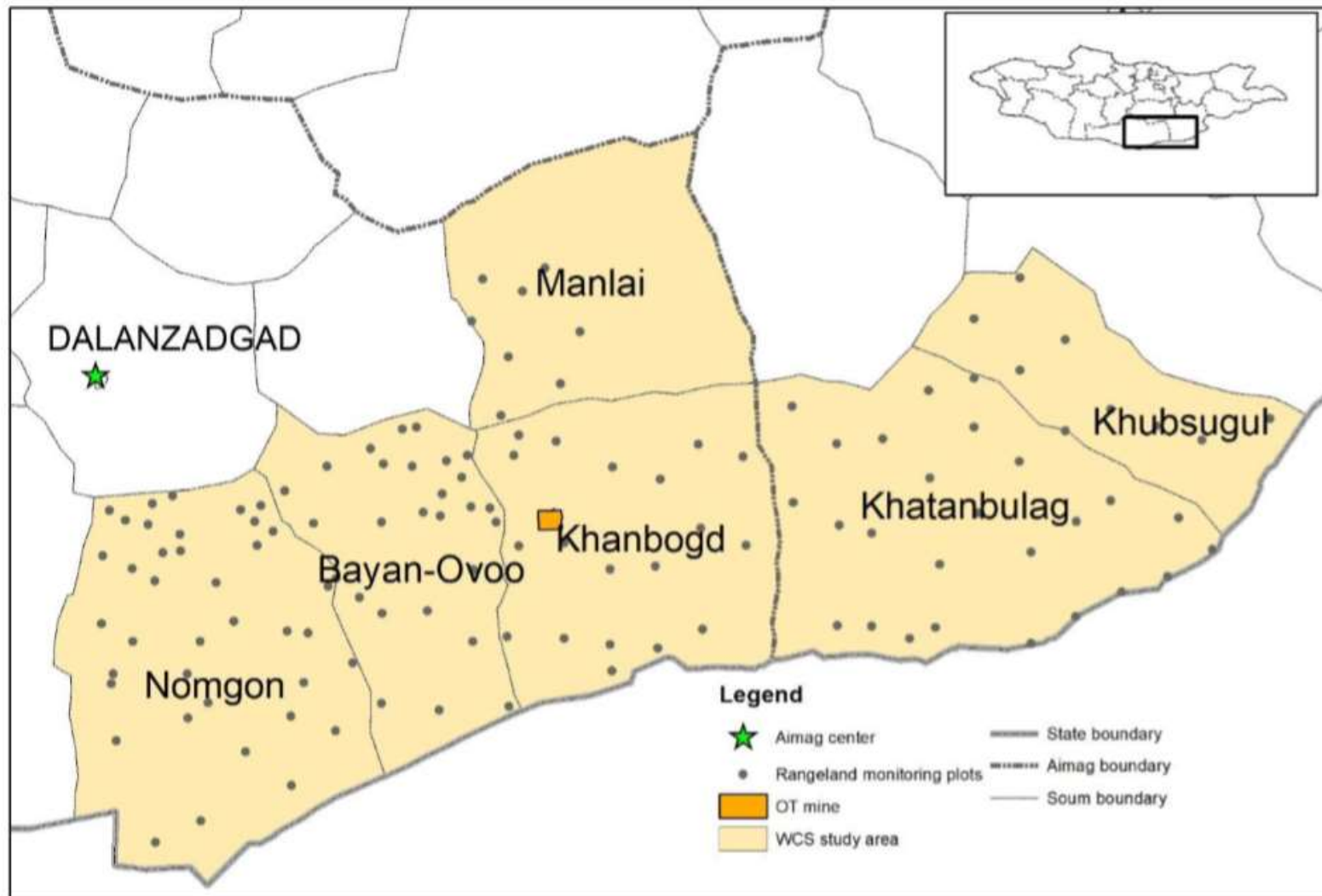
K E R I N G

How can we verify that cashmere is sustainable?



How much can management contribute to rangeland health, amidst other global changes? And will this be adequate to support wildlife and maintain herder livelihoods?

Rangeland monitoring plot location



155 sites

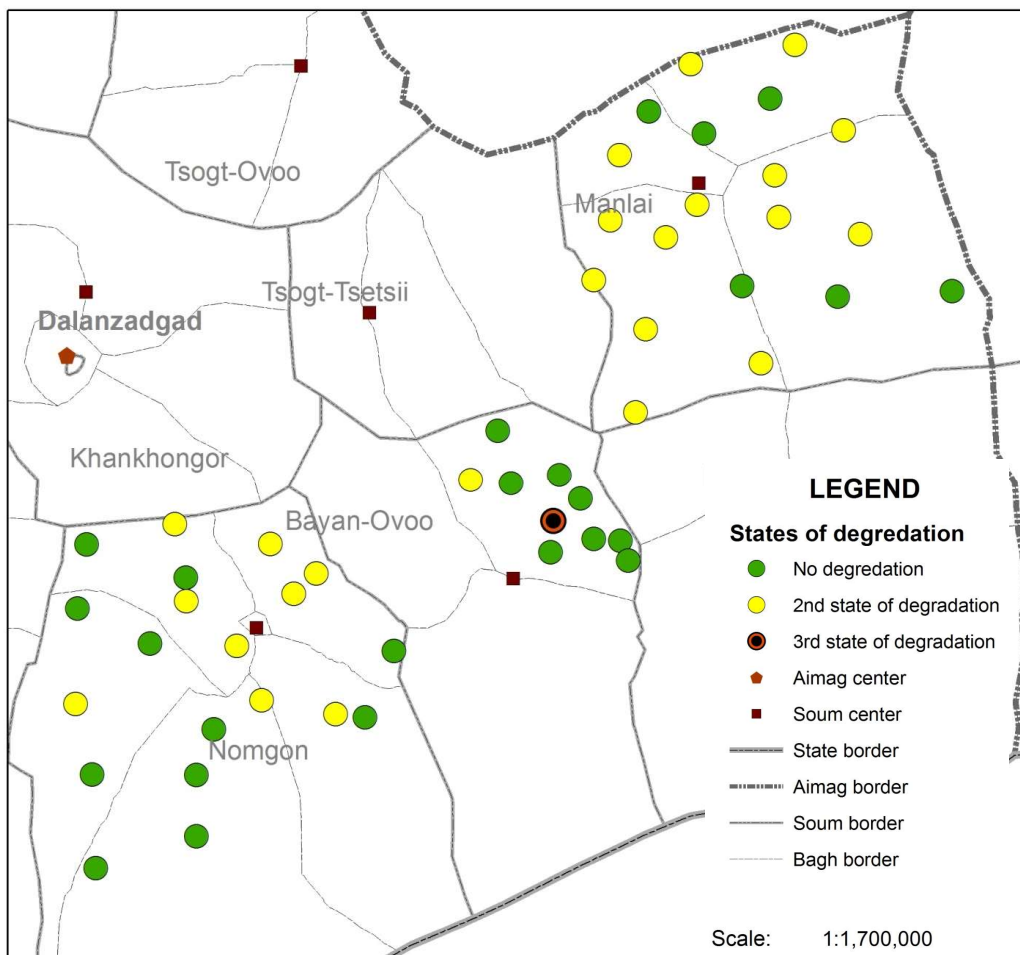
Sampled 1x
per year

250,000
hectares

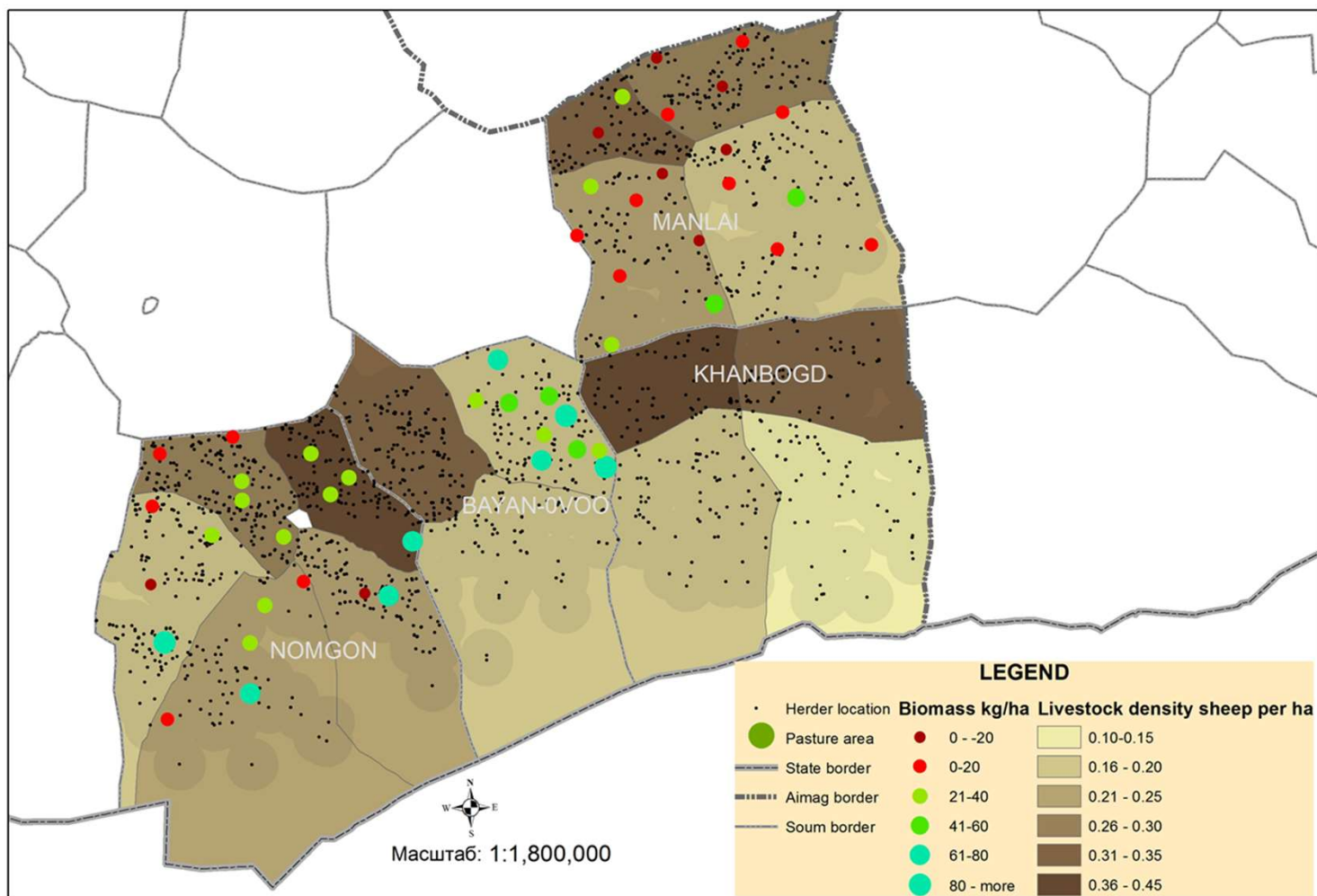
140
households

>50,000
goats

The South Gobi is overstocked and degraded



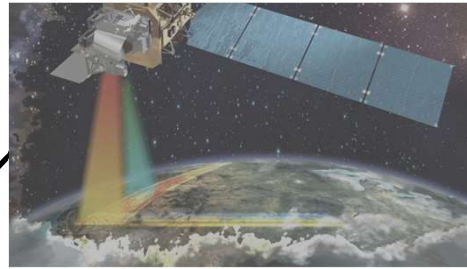
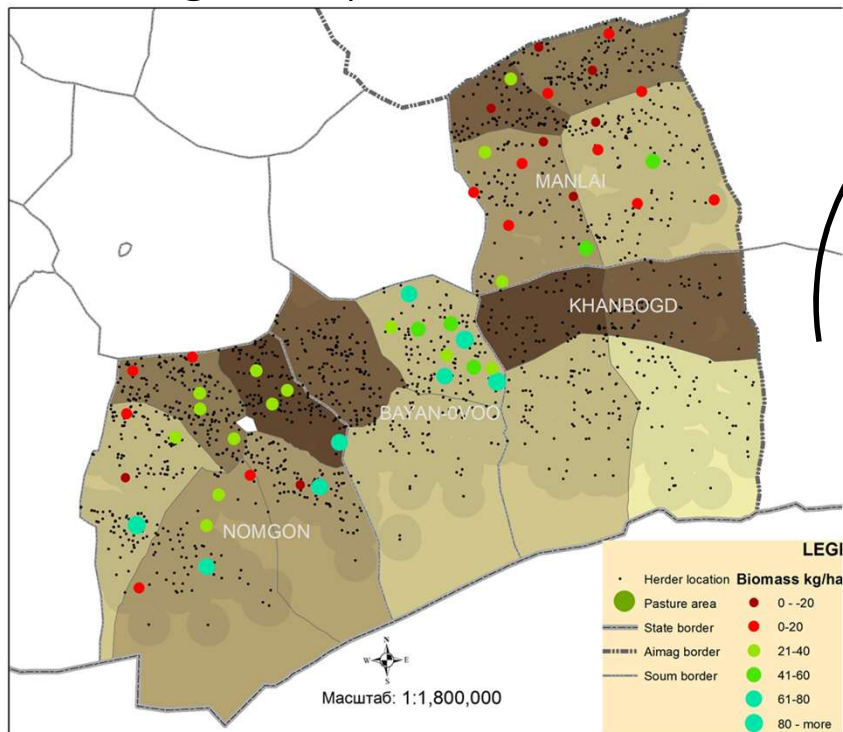
The South Gobi is highly spatially heterogeneous



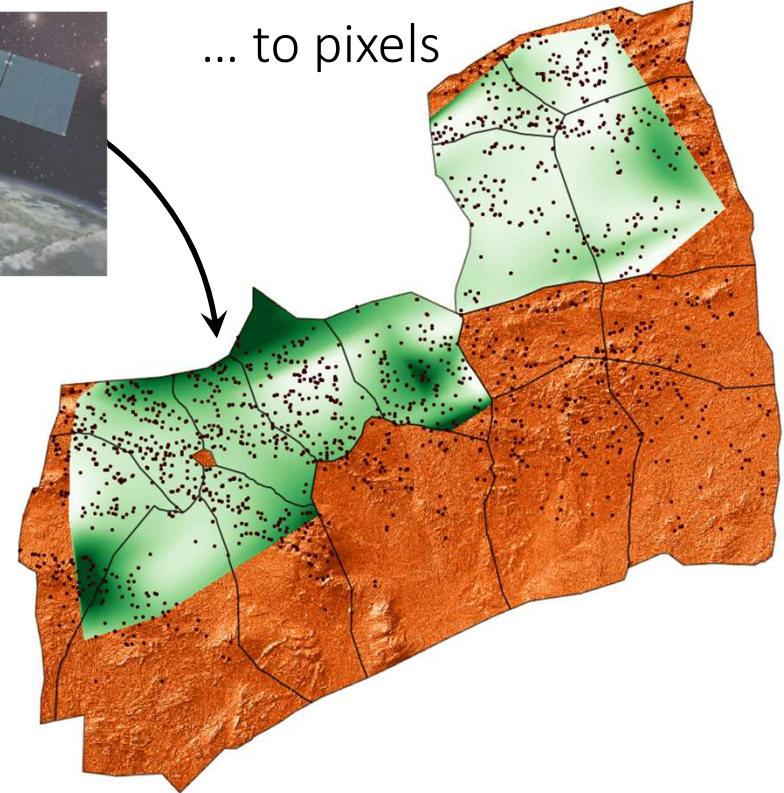
Goals for NASA project:

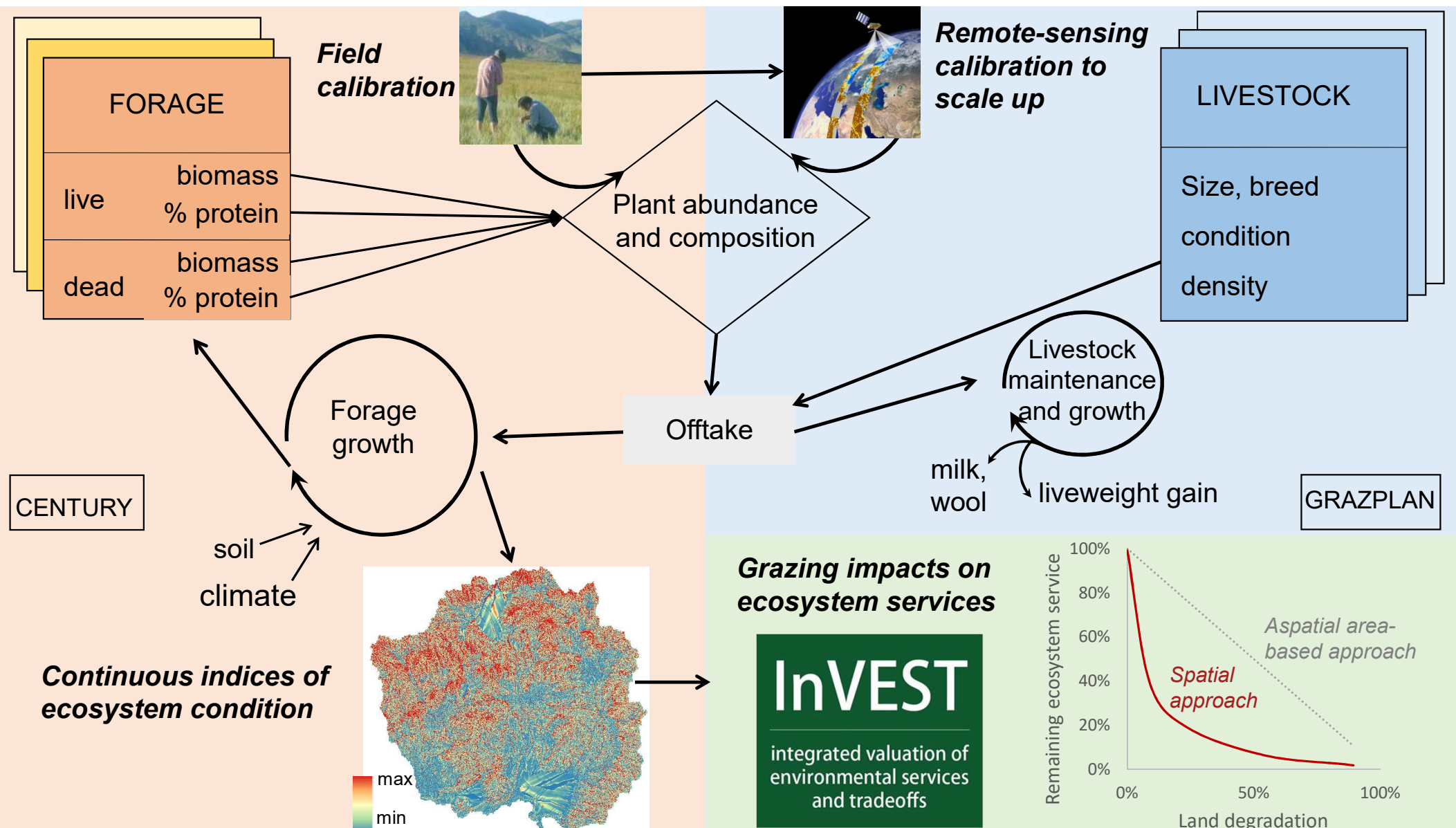
- 1) track progress toward sustainability
- 2) anticipate management impacts

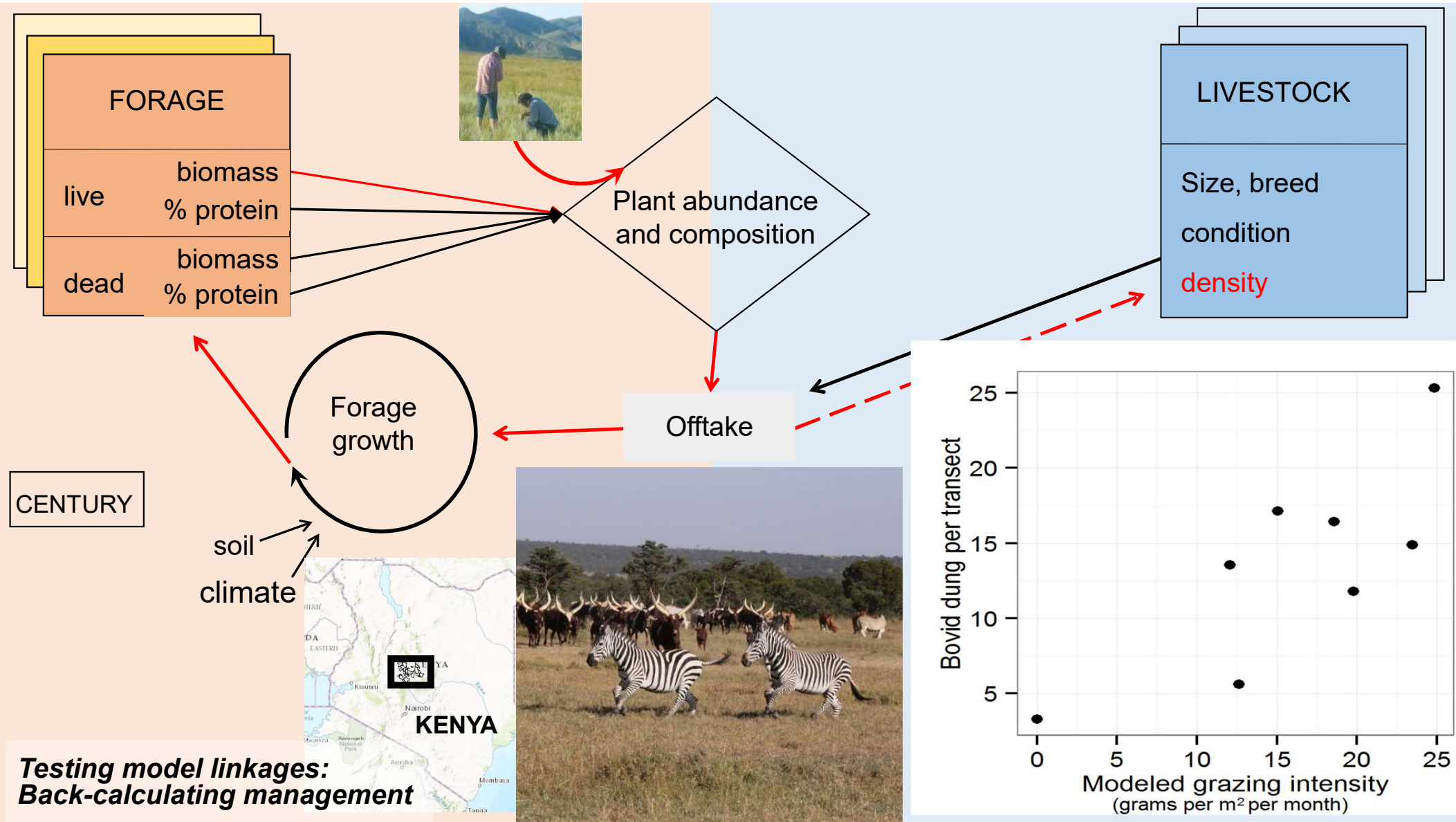
Moving from points...



... to pixels





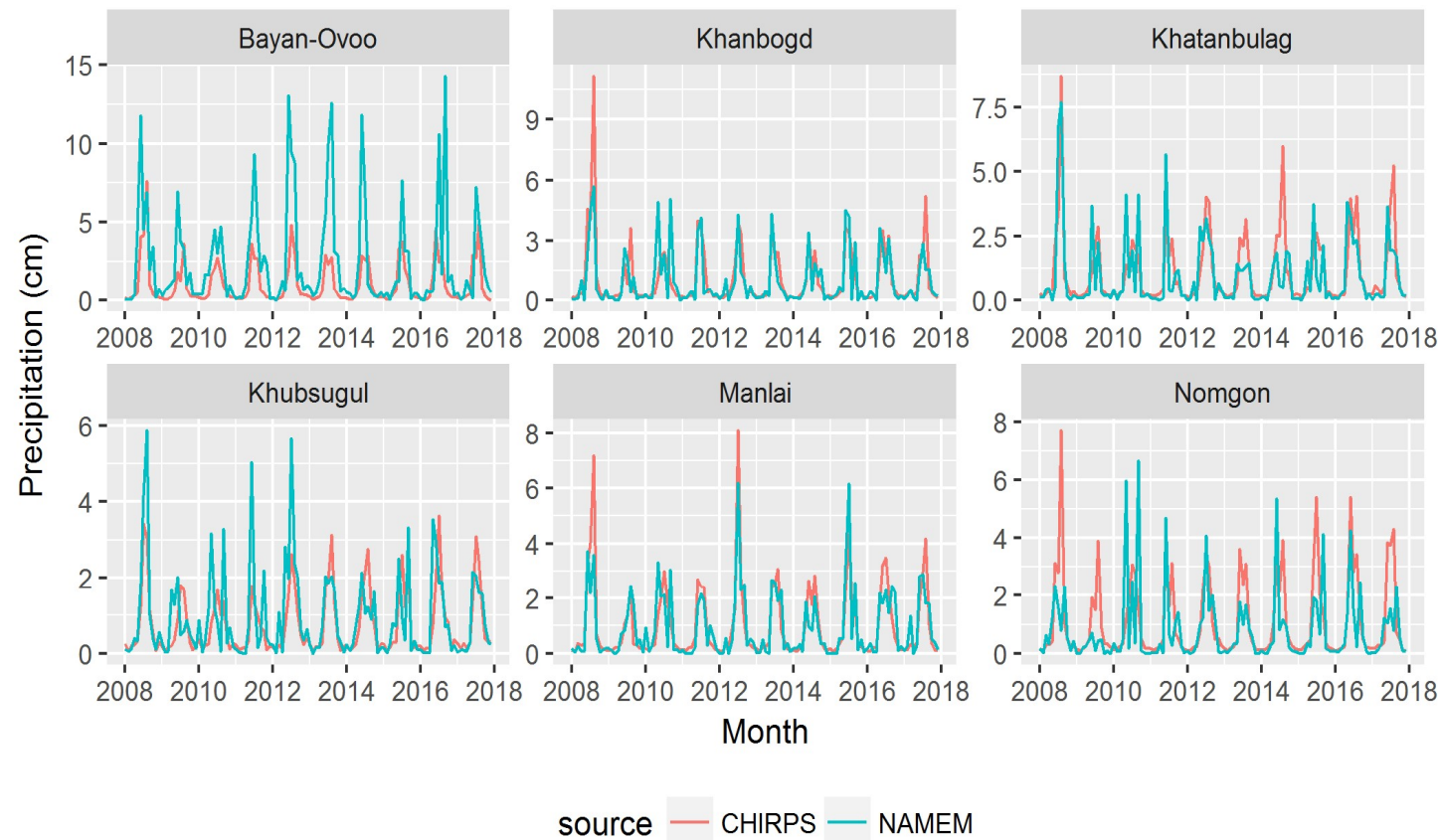


How to move from points to pixels?

- Gridded calibration via remote-sensing
- Using gridded inputs

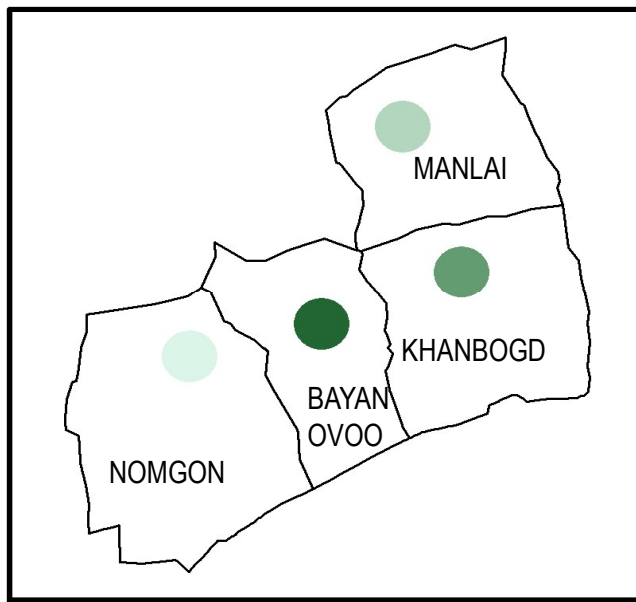
CHIRPS

Climate Hazards
Group InfraRed
Precipitation with
Station data

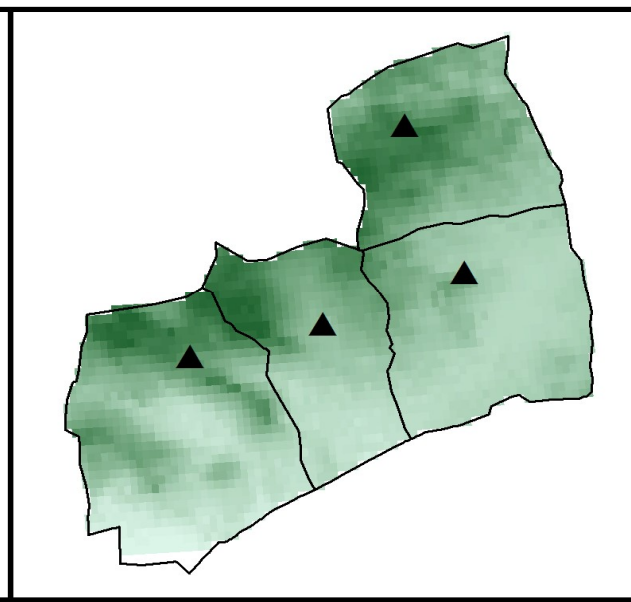


Predicting spatial variation in forage production

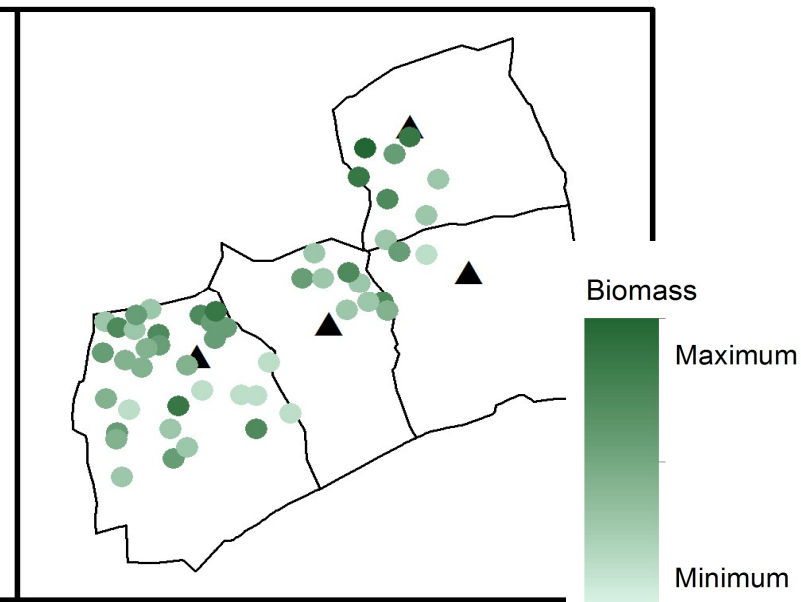
**Simulated - using
NAMEM (Weather-station)**

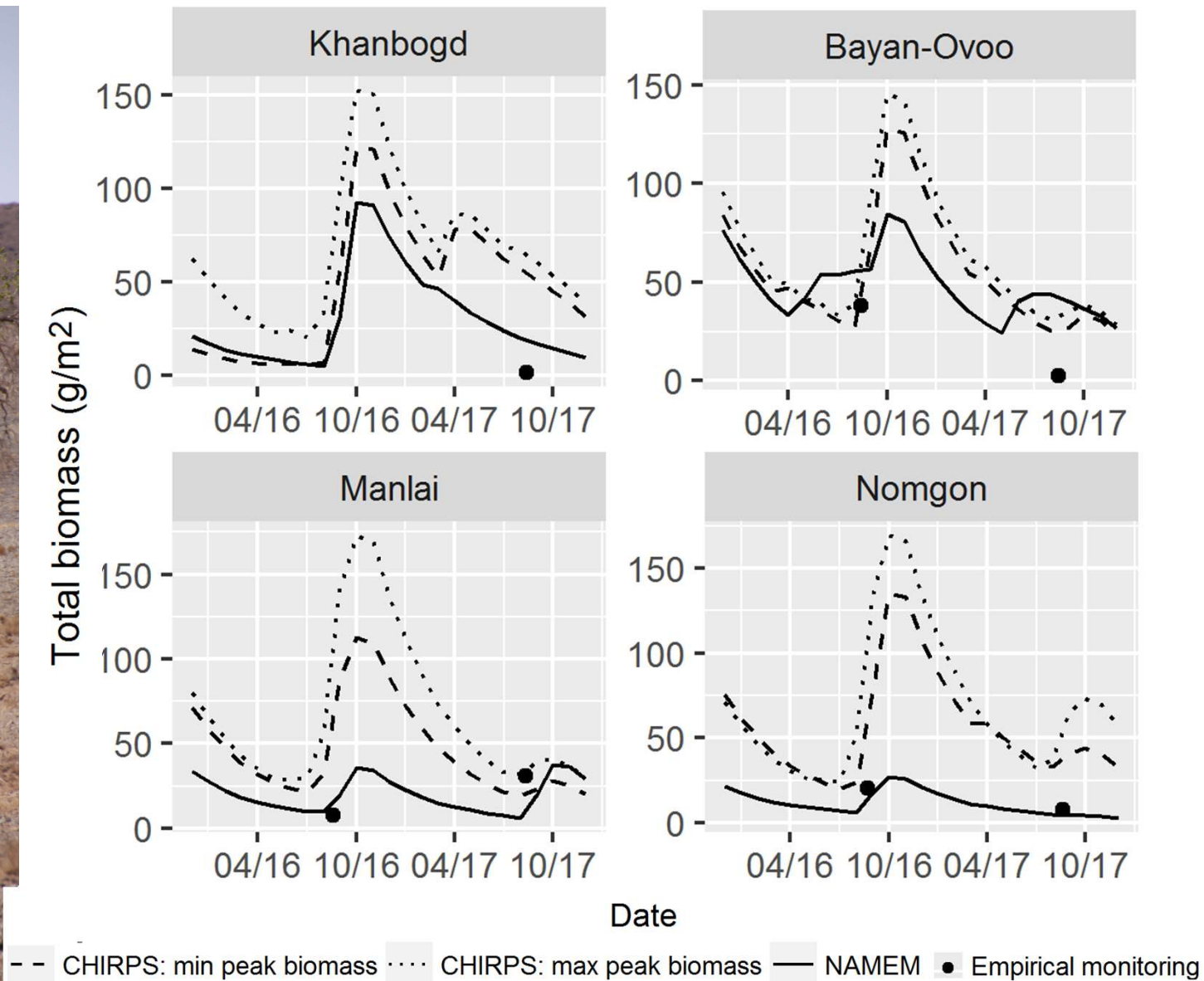
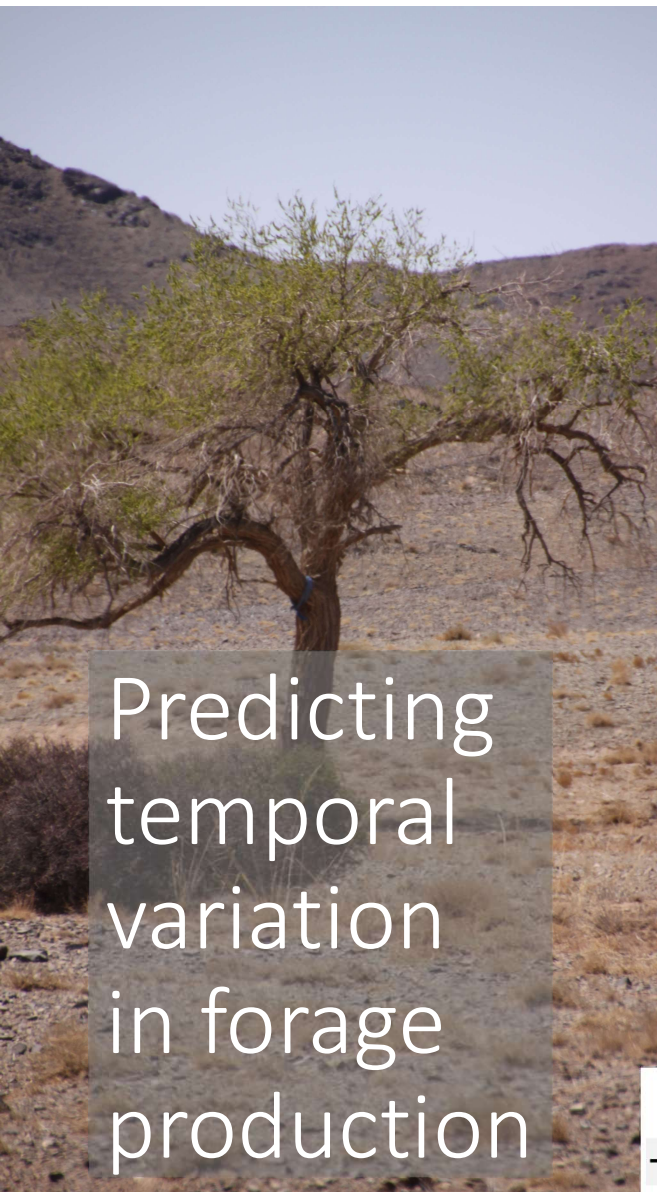


**Simulated - using
CHIRPS (Satellite)**



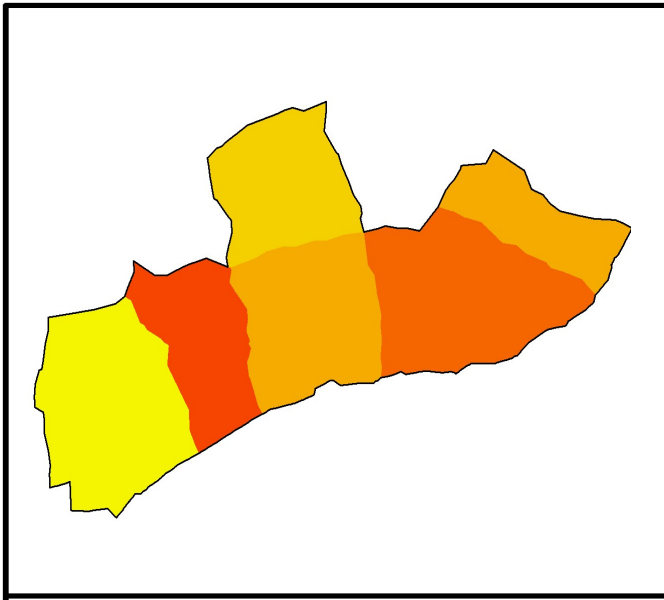
Empirical – field surveys



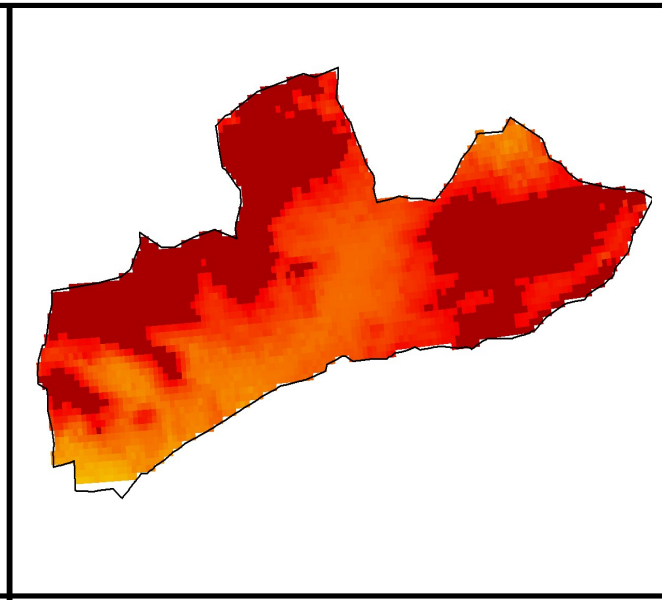


Predicting spatial variation in carrying capacity

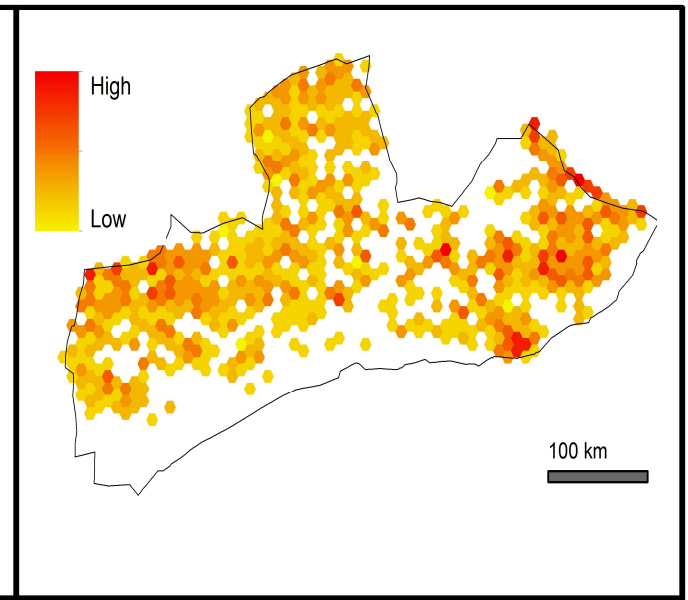
**Simulated - using
NAMEM (Weather-station)**



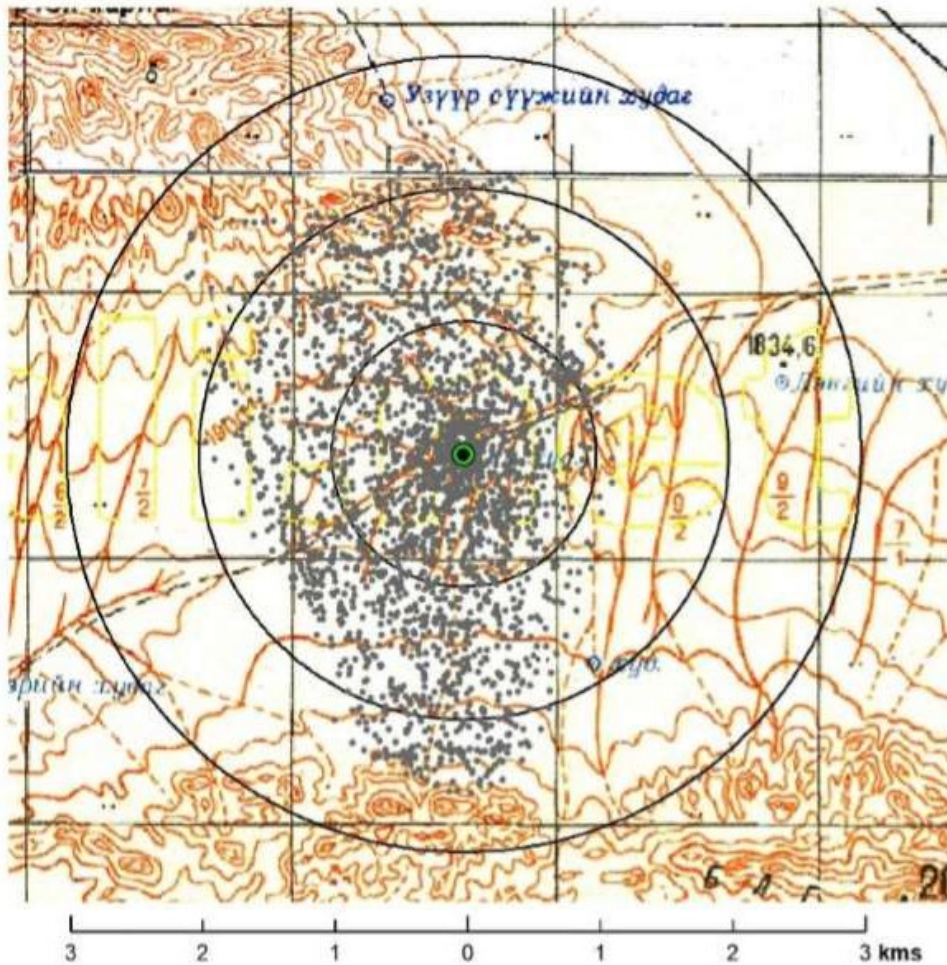
**Simulated - using
CHIRPS (Satellite)**



Empirical – field surveys






Challenges in measuring grazing intensity directly



Goat GPS locations
for summer grazing
(7/31/2017-8/24/2017)

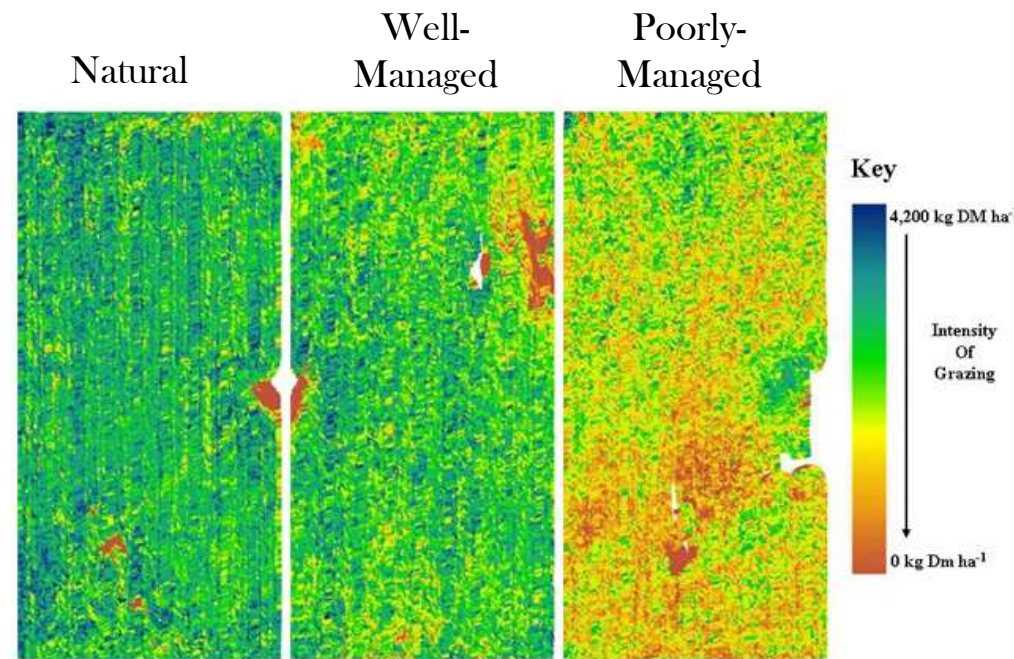
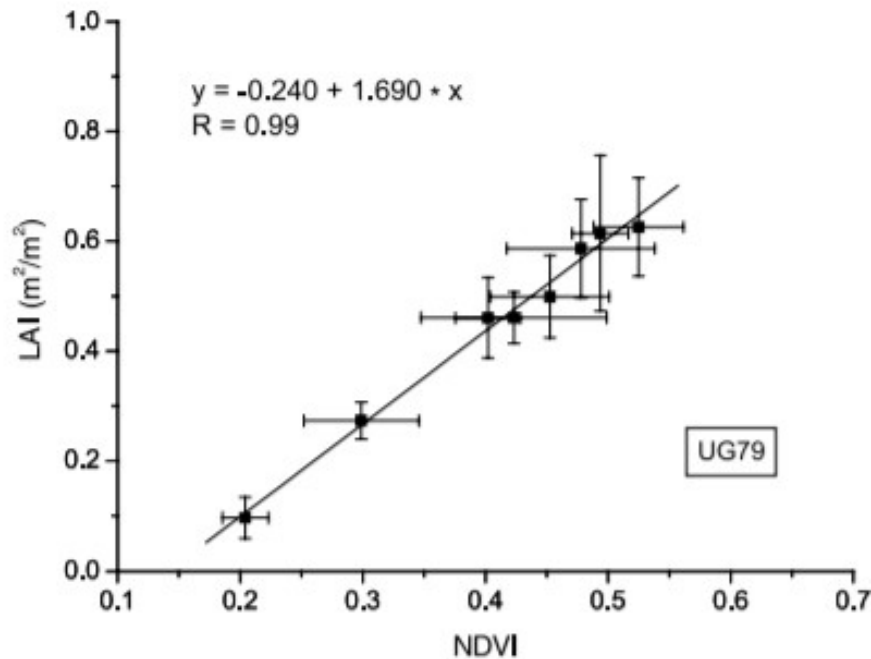
Kh.Enkhbayar,
Khurkhiin naran cooperative
Kharmagtai bagh,
Nomgon soum

Legend

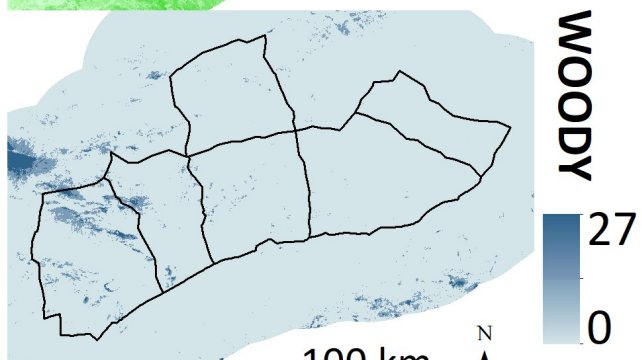
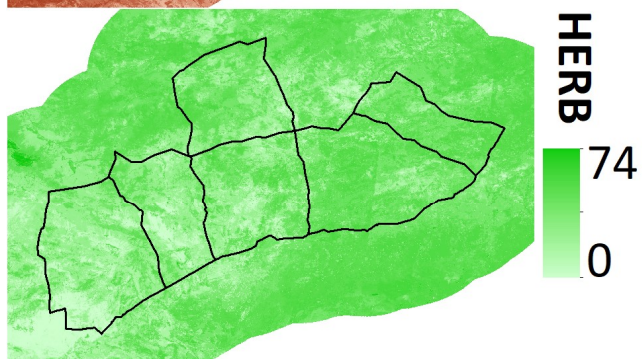
-  Herder location
-  Goat trail
-  Buffers with 1 km steps



Next steps: calibrating or “back-calculating” grazing intensity with remote-sensing of vegetation



Investigating the relationship between NDVI and LAI in semi-arid grassland in Inner Mongolia using *in-situ* measurements
Fan et al. 2009

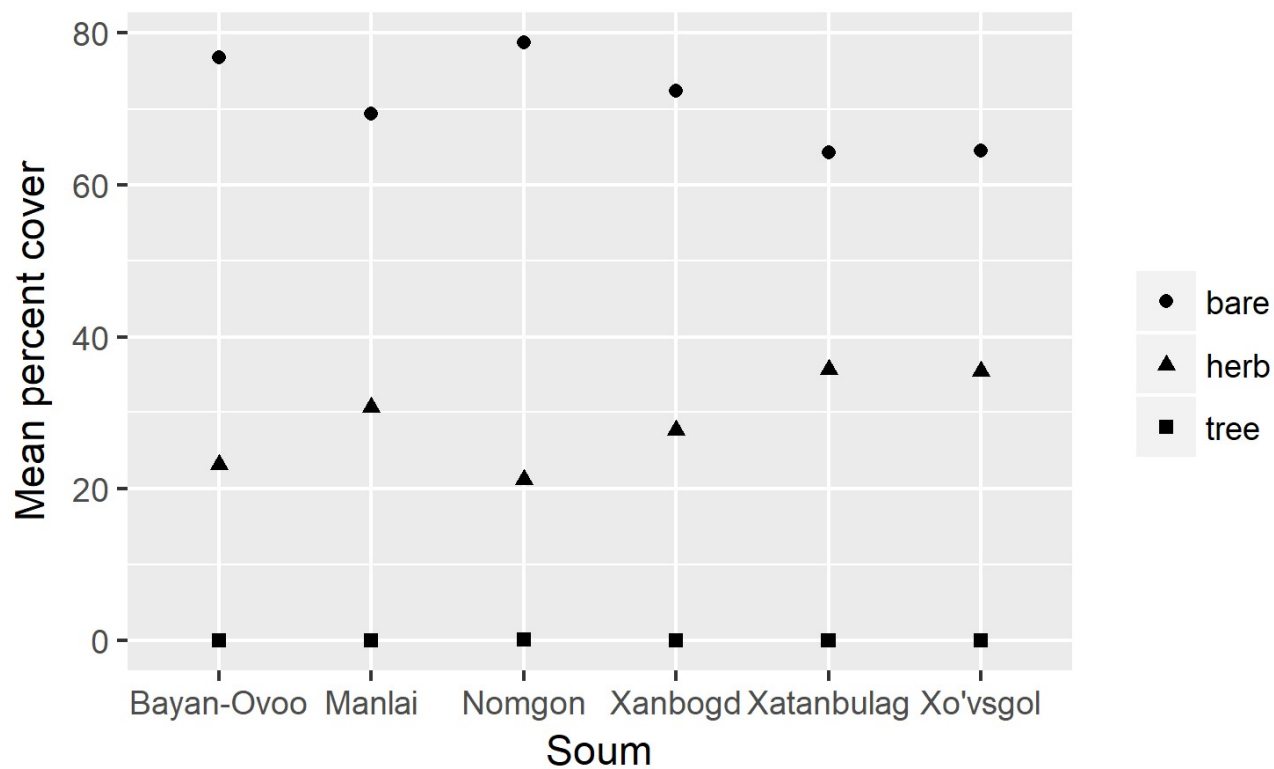


MODIS VCF

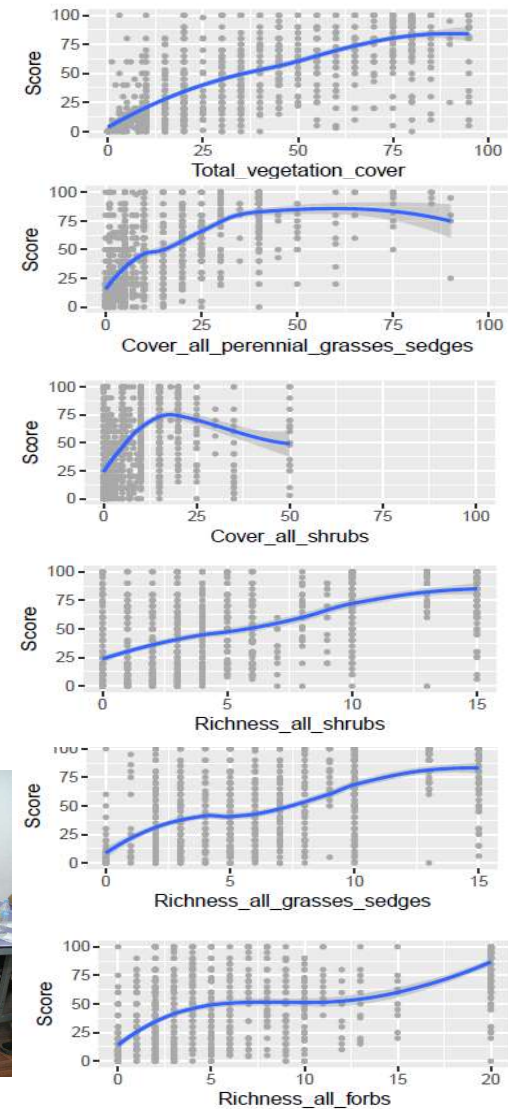
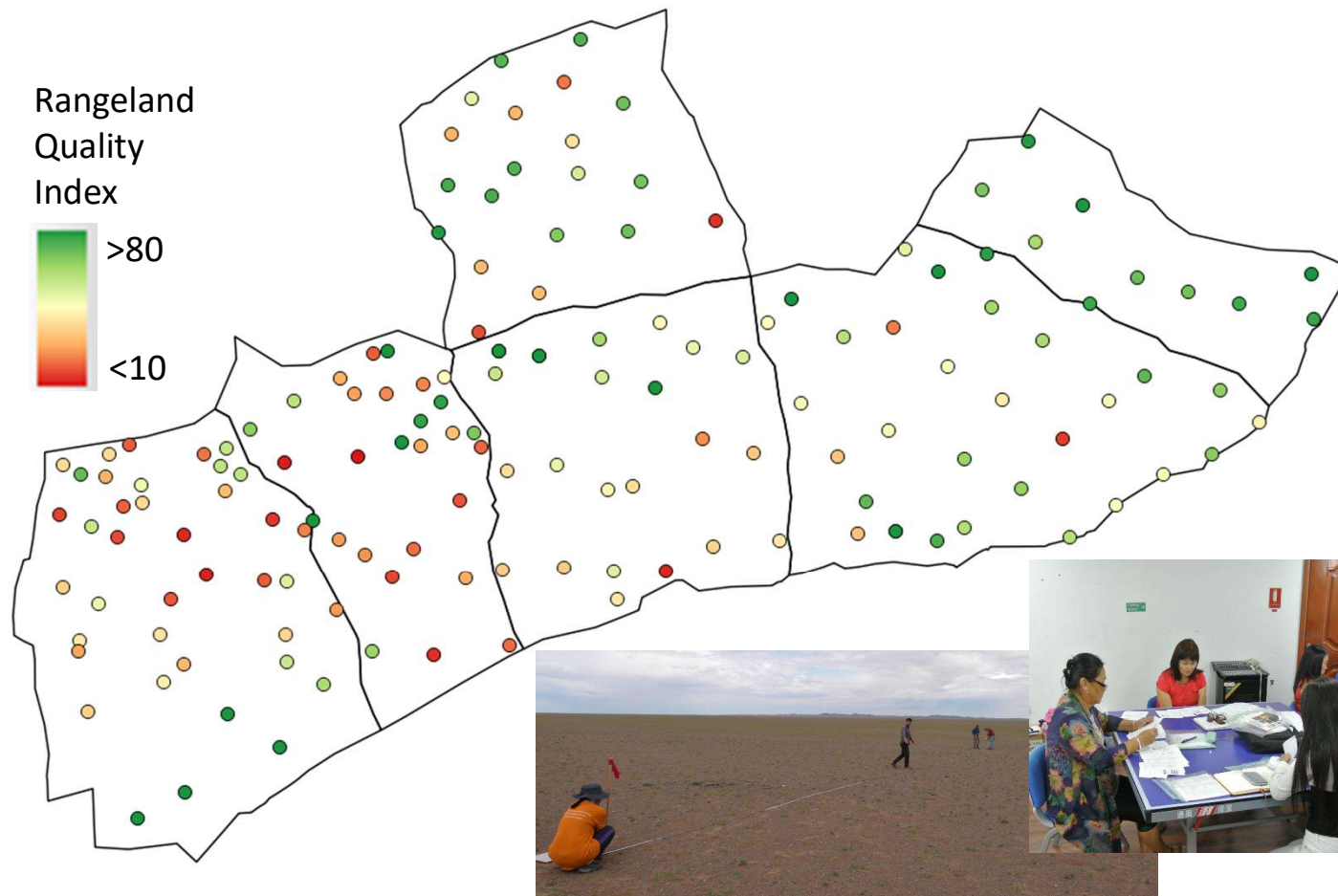
100 km



Which indices to use when bare ground dominates?

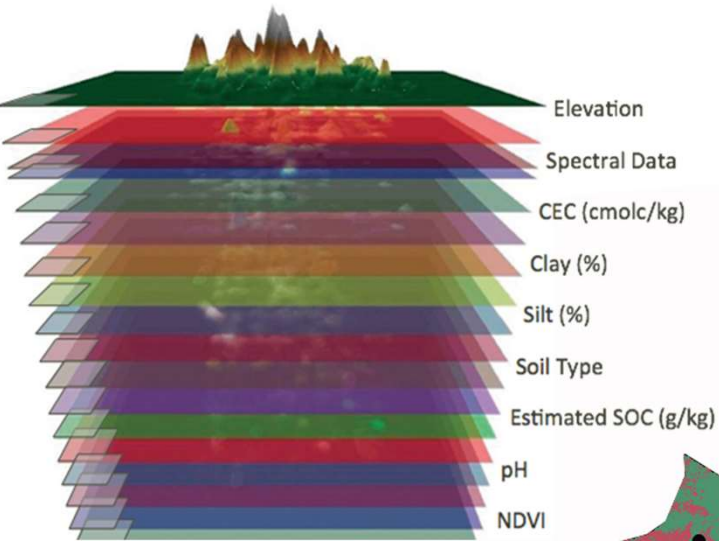
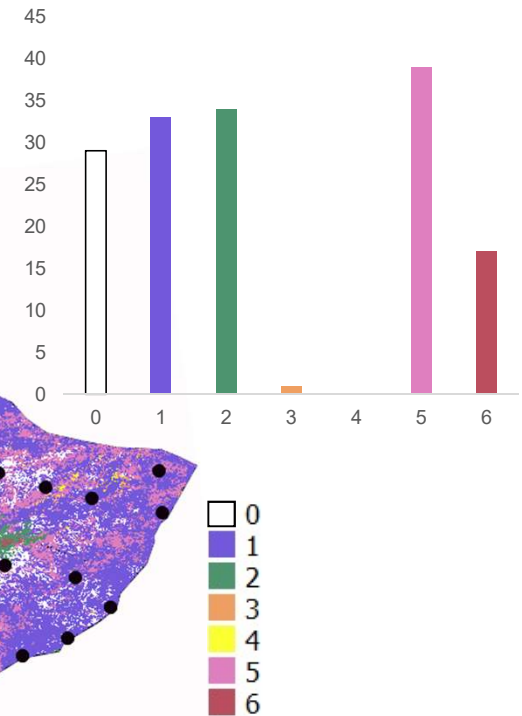


How to represent “rangeland quality” characterized by experts?

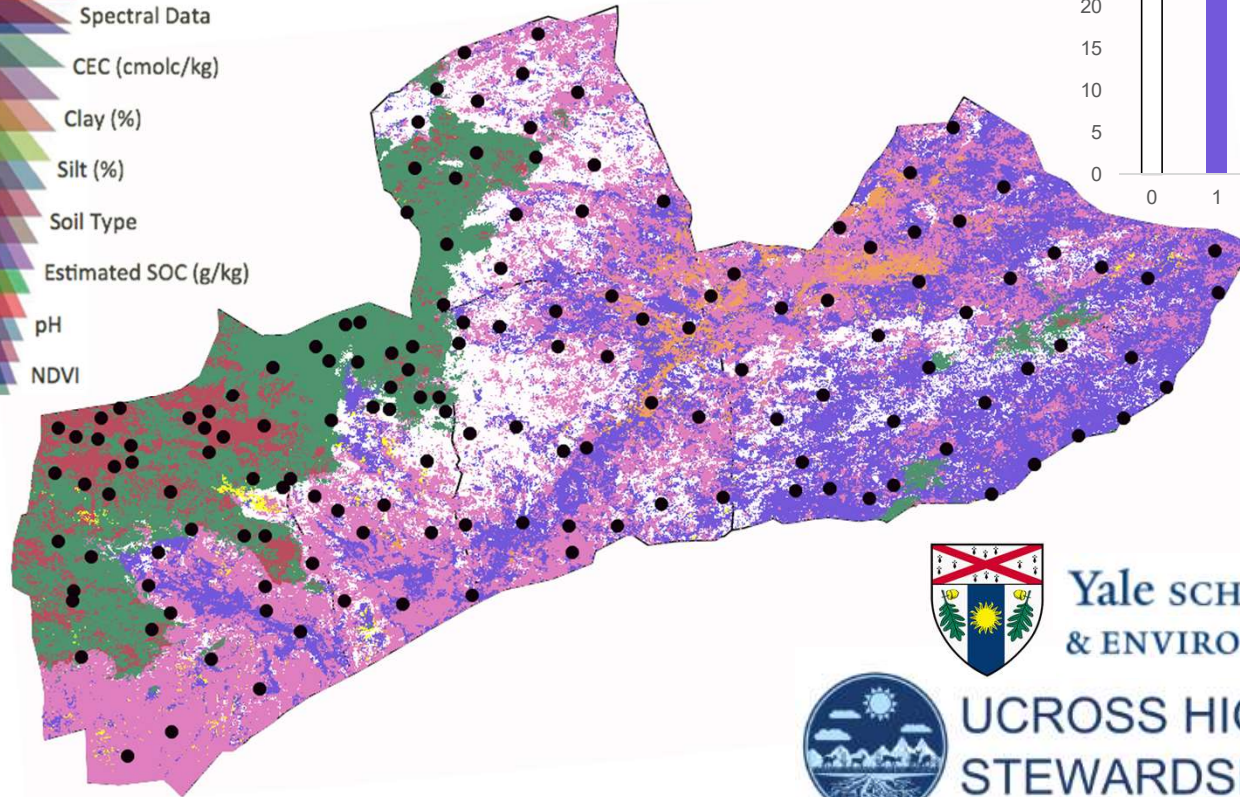


How well does sampling space capture natural variability?

SCP points on Stratified Vegetation Classes



SRTM - elevation & slope
Landsat 8 - Greenest pixel
annual composite NDVI
SoilGrids - 250m global
soil characteristics



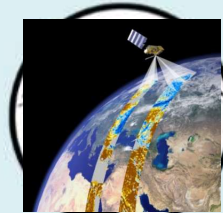
Yale SCHOOL OF FORESTRY
& ENVIRONMENTAL STUDIES

UCROSS HIGH PLAINS
STEWARDSHIP INITIATIVE

Measurements

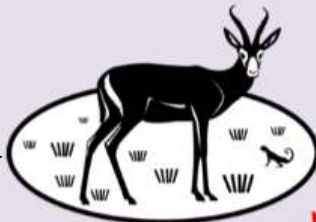


Wildlife monitoring



Rangeland monitoring

Goals



Improvements in wildlife habitat and population



Improvements in rangeland condition



Improvements in value addition from cashmere and livestock products

Actions



No poaching



Pasture management

Incentives for action



Awareness



Guardian dog



Certification



Capacity building



Breeding



Health



Alternative income



Sorting, cleaning



WOODS INSTITUTE
FOR THE ENVIRONMENT
STANFORD UNIVERSITY



Samdanjigmed Tulganyam, Dave Hamilton, Erdenebayar Naran (OT), Onon Bayasgalan, Otgonsuren Avirmed, Lkhamsuren Bolor Erdene, Enkhtuvshin Shiilegdamba, Aili Kang, Ray Victorine (WCS), Stuart Antsee (Stuart Anstee & Assoc.), Becky Chaplin-Kramer, Rich Sharp, Ginger Kowal, Mary Ruckelshaus (NatCap)

